Recovering Aquatic Species at Risk:

The valuation of management actions for incorporation into policy decisions

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Introduction

- Management goal: ensuring growth and economic prosperity of Canada
- Fishing: commercial fisheries contribute to Canada's economic prosperity
- Species at Risk: policy changes required
- Demands ongoing economic and policy research
- Cost-benefit analysis of policy changes requires non- market values (NMV)

Study Focus

- NMV addresses benefits from species recovery for average Canadian.
- Value may stem from:
  - view species in the future
  - appreciation for intact ecosystems
  - ensure species existence
  - option to “use” the species in the future

NMV and Aquatic Species at Risk

- NMV of protection and recovery of aquatic species at risk needed in Canada
- Primary studies for each management action unfeasible due to costs
- Instead: design suite of studies to use for benefit transfer
- Eight NMV surveys by DFO in past 6 years

Methodology

- Three national surveys undertaken in 2010-11, with results of two to be presented here
- Focus of this study:
  - A Pacific Rockfish
  - A population of Lake Sturgeon
  - for each, examined effects of species characteristics and management actions
- Third survey: no particular species, valuation only by characteristics such as class of species, distribution, cause of decline, commercial status, etc.

Methodology

- Baseline and projected scenarios developed through collaboration with species experts
- Contingent valuation (CV) questions with baseline and proposed management scenarios employed
- Focus groups included in survey development; two pilot tests prior to survey implementation

Methodology

- 4 strategies applied to minimize the possibility of hypothetical bias:
  1. A cheap talk script was included in the survey before the choice questions
  2. Multiple voting scenarios in randomized order were given to each respondent respondent
  3. Uncertainty adjustments
  4. Identification of yea-sayers

Sample Question

	Current Management Option	Proposed Management Option
Strategy for protection	No new regulations	Program 1
Listing status	In 40 years the listing status for this species will be:	In 40 years the listing status for this species will be:
	Endangered	Threatened
Probability of extinction (in 10 years)	Very High	High
Increased cost to your household in extra taxes every year for 10 years	$ 0	$50

Respondents were asked to treat the question as a vote, and indicate which option they would choose

Modeling

$$U_{yes} = x'_{yes}\beta + \varepsilon_{yes} \text{ and } U_{no} = x'_{no}\beta + \varepsilon_{no}$$

$$Prob\,[vote = 1|x] = Prob\,[U_{yes} > U_{no}]$$

$$Prob\,[vote = 1|x] = Prob\,[(x'\beta+\varepsilon)>0|x]$$

Modeling

- Conditional logit model used for CV question analysis
- Regression estimates probability of a yes vote given explanatory variables such as:
  - A species' expected status, endangered, threatened, special concern or not at risk after 10 years,
  - The program's cost,
  - Respondent demographics
  - Species characteristics
- Including the species' status enabled a unique marginal analysis of differing SARA levels

Modeling Cont.

- Model structured to estimate respondents' WTP for a program that avoids the worst case (baseline=endangered) outcome
- Dummy variables included for threatened and special concern outcomes
- Constant coefficient represents probability of a yes vote for a program with an outcome of not at risk

Model Results (Rockfish)

Vote	Coefficient	e^{β}	Standard Error	Wald's X^2	z	Prob. z>Z*	95% Confidence Interval	
Constant	-1.026*	0.359	0.079	168.671	-13.050	0.000	-0.870	-1.180
Cost	-0.007*	0.993	0.000	563.057	-22.951	0.000	-0.010	-0.010
Threat	-0.477*	0.621	0.098	23.691	-4.848	0.000	-0.280	-0.670
Spc. Con	-0.184***	0.832	0.098	3.525	-1.869	0.062	0.008	-0.380

* Statistically significant at 99% level

** Statistically significant at 95% level

*** Statistically significant at 90% level

Model Results (Lake Sturgeon)

Vote	Coefficient	e^{β}	Standard Error	Wald's X^2	z	Prob. z>Z*	95% Confidence Interval	
Constant	-0.996*	0.369	0.089	125.239	-11.207	0.000	-0.820	-1.170
Cost	-0.011*	0.989	0.001	121.000	-21.753	0.000	-0.010	-0.010
Thr	-0.315**	0.730	0.111	8.053	-2.837	0.000	-0.100	-0.530
Spc	-0.209***	0.811	0.112	3.482	-1.871	0.061	0.011	-0.430

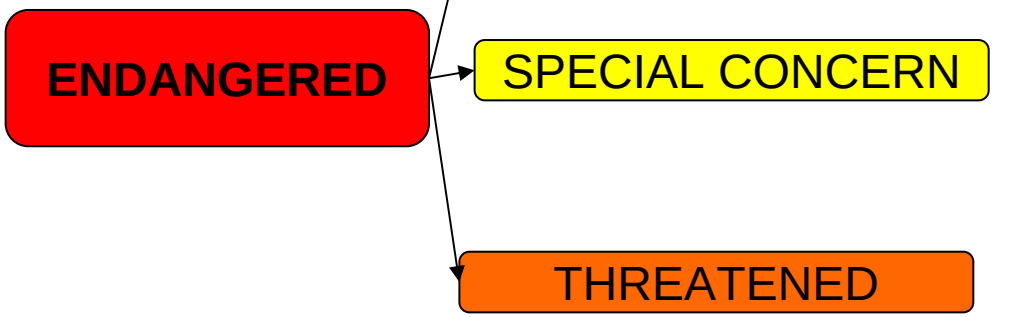
* Statistically significant at 99% level

** Statistically significant at 95% level

*** Statistically significant at 90% level

Single Species Results

- NMV for study species depends on degree of species improvement



	Pacific Rockfish*	Lake Sturgeon (DU8)*
NOT AT RISK	**$151**	**$92**
SPECIAL CONCERN	**$124**	**$78**
THREATENED	**$ 81**	**$62**

*Values per household annually for 10 years

Model Results (Rockfish)

Vote	Coefficient	e^{β}	Standard Error	Wald's X^2	Prob. z>Z*
Constant	-0.446*	0.640	0.178	168.671	0.000
Cost	-0.007*	0.993	0.000	563.057	0.000
Threat	-0.477*	0.621	0.099	23.691	0.000
Spc. Con	-0.186***	0.832	0.100	3.525	0.062
Kids	-0.049	0.953	0.094	0.267	0.605
Male	-0.027	0.974	0.084	0.100	0.751
Income	-0.005*	0.995	0.001	28.706	0.000
Age	-0.003	0.997	0.003	0.747	0.396
Degree	-0.770**	0.463	0.327	5.547	0.019
Fish Ind	-0.437	0.646	0.291	2.254	0.134
Env. Org.	-0.620	0.538	0.189	10.761	0.001
RSqrd = .41845			AIC =1.08153		
Log-Likelihood = -1768.662			BIC = 1.10192		

* Statistically significant at 99% level ** Statistically significant at 95% level *** Statistically significant at 90% level

Conclusion

- Results will be included in socio-economic analyses, ensuring comprehensive total economic values used
- Attribute results highlight species and individual characteristics' effect on NMV
- Benefit transfer estimation undertaken for management actions for aquatic species at risk will be refined
  - Significance of species characteristics suggest potential for NMV solely through characteristic values

Thank you!

Questions or Comments?